REMARKS

Claims 1-4 were filed and are pending. Claim 4 has been allowed. Claims 1 and 2 were rejected under 35 U.S.C. § 102. Claim 3 was rejected under 35 U.S.C. § 103. Claims 1 and 4 have been amended. Claims 5-18 have been added. Reconsideration and allowance of Claims 1-4, and allowance of Claims 5-18, is requested.

Rejection of Claims under 35 U.S.C. § 102

In the Office Action, Claims 1 and 2 were rejected under 35 U.S.C. § 102 as being anticipated by McCutchen (U.S. Patent No. 5,040,081). The Office Action stated:

> McCutchen discloses an audiovisual synchronization method using audio signature comparison comprising first and second sets of high resolution (audio) data from a slave and master video source (figure 4), analyzer 70 and synchronizer 80. The analyzer 78 digitizes the audio data from the video sources (A/D converter 43) and holds the data to a spectral frame buffer 44. Column 6 lines 45-59 disclose that an envelope information analysis concerns itself with the amplitude (magnitude) of the inputted signals. The data from the spectral frames are inputted to cross-correlator board 55. The table in column 9 discloses that the "lock" comparison buffer for envelope values is done over one video frame or compared 10 at a time. Thus, McCutchen discloses computing a magnitude only spectrogram for the sets of high resolution data and having a spectrogram slice length and step size that is 1/29.97 second (1 video frame). The cross-correlator board 55 computes a one-dimensional cross-correlation of the magnitudes and selects an alignment based on the cross-correlation.

Claim 1 has been amended to clarify the recitations in that claim. (As will be appreciated from the discussion below, the amendments to Claim 1 are not necessitated by the teaching of McCutchen.) As amended, Claim 1 recites (emphasis added):

> A method for aligning first and second sets of data, each of the first and second sets of data including first and second subsets of data aligned with respect to each other, each first subset of data having a first resolution and each second subset of data having a second resolution that is lower than the first resolution, the method comprising the steps of:
>
> computing a magnitude-only spectrogram for each of the first subsets of data of the first and second sets of data, using a spectrogram slice length that is appropriate for the stationarity characteristics of the first subsets of data of the first and second sets of data and a spectrogram step size that is appropriate for the quantization period of the final alignment;;
>
> computing a one-dimensional cross-correlation of the magnitude-only spectrograms for the first subsets of data of the first and second sets of data; and
>
> selecting an alignment of the first subsets of data, and, consequently, the first and second sets of data, at the second resolution, based on the cross-correlation.

McCutchen teaches, in the Abstract of the McCutchen patent (emphasis added):

> A method and apparatus for synchronizing a plurality of signals to a desired signal. The present invention provides real time synchronization of similar audio and any associated sequence of images, either on video or on film, without the need for a separate reference or carrier frequency to be added to both signals. A slave input is synchronized to a master input signal. ... In the preferred embodiment of the present invention, three methods of analysis are used on the inputted signals, a bandpass method, a mathematical method and an envelope method. The outputs of the three methods of analysis are inputted to a cross correlation processor which compares the respective analysis outputs for the master and slave inputs. ... [A] computer then outputs a speed control signal, usually to a variable SMPTE generator, which drives a transport control synchronizer to change the speed of the player of the slave signal to keep it in synchronization with the master signal.

McCutchen also teaches, at column 6, line 33-44 of the McCutchen patent (emphasis added):

> A spectral frame is a predefined amount of time, similar to a film frame, containing a "snapshot" of all the signature information known about the sound at that moment. At the rate of 300 spectral frame per second, there are 10 spectral frames per video frame at the rate of 30 frames per second, or 12.5 per film frame at the rate of 24 fps. The time of a spectral frame provides a horizontal axis, the frequency information provides a vertical axis, and amplitude information provides a Z axis; thus a spectral frame is a three-dimensional unit containing information about the essential characteristics of the sound.

McCutchen further teaches, at column 8, line 59 to column 9, line 3 of the McCutchen patent (emphasis added):

> The spectral frames from the master and slave are compared in the cross-correlator board 55, which separately and simultaneously compares the result of all three types of analysis of the master and slave signals. In the preferred embodiment of the present invention, ten spectral frames are compared at a time, each containing bandpass and FFT readings of eight frequency bands, as well as envelope information. Within this sample of ten spectral frames, each method of analysis and each frequency band is compared separately. In the comparison process, the frequency band or envelope values are multiplied against each other, in sequential combinations.

Finally, McCutchen teaches, at column 9, lines 11-20 of the McCutchen patent (emphasis added):

> The system looks for peaks which indicate that patterns of like values have been matched against each other. The processor then evaluates the results produced from each of the three methods of analysis to detemine the best fit of the data. ...
>
> The present invention then advances the spectral frames by one, and runs the comparison again. ...

Thus, as indicated by the above (particularly the emphasized sections), McCutchen appears to teach aligning audiovisual data at the level of resolution of a spectral frame of audio data,

which is a higher resolution (e.g., 10 times higher) than the resolution of the video data that accompanies the audio data. (McCutchen does not appear to, as stated in the Office Action, "[disclose] computing a magnitude only spectrogram for the sets of high resolution data .. having a spectrogram ... step size that is 1/29.97 second (1 video frame)," see, e.g., column 9, lines 19-20 of the McCutchen patent, reproduced immediately above.) Aligning with such fine granularity is appropriate for the application with which McCutchen is concerned: maintaining synchronization between two sets of audiovisual data during playback by slaving one display to another (see, e.g., the abstract of the McCutchen patent, reproduced above). McCutchen does not teach or suggest a method as in Claim 1 and, in particular, does not teach or suggest computing a one-dimensional cross-correlation of magnitude-only spectrograms for first subsets of data (e.g., audio data) of first and second sets of data (e.g., sets of audiovisual data) and selecting an alignment of the first subsets of data, based on the cross-correlation, at a resolution that is lower than that of the first subset of data (e.g., aligning high resolution audio data at a lower video frame rate resolution). A method as recited in Claim 1 is appropriate for applications in which the fine granularity of alignment taught by McCutchen is not needed. As stated in Applicant's specification states, at page 4, lines 10-22:

> According to one aspect of the invention, wide-bandwidth, high resolution data streams can be aligned at a lower resolution in a manner that retains the full bandwidth of the data, but only samples the cross-correlation at a coarse sampling rate that is a final

> alignment quantization period corresponding to the lower resolution. For example, this aspect of the invention can be used to align audiovisual data streams at the resolution of the video data, using the audio data to produce the alignment.
>
> Quantized alignment of wide-bandwidth data streams according to this aspect of the invention avoids problems with undersampling by using magnitude-only spectrograms as inputs into the cross-correlation.

As further stated in Applicant's specification states, at page 5, lines 14-16:

> Quantized alignment of wide-bandwidth data streams according to this aspect of the invention reduces overall computational requirements compared to previous approaches.

Since a method as recited in Claim 1 aligns sets of data at a higher resolution than that taught by McCutchen, the method of Claim 1 reduces computational requirements as compared to a method taught by McCutchen.

In view of the foregoing, Claim 1 is allowable over the teaching of McCutchen. Further, Claim 2, which depends on Claim 1, is therefore allowable for at least the reasons given above with respect to Claim 1.

In view of the foregoing, it is requested that the rejection of Claims 1 and 2 under 35 U.S.C. § 102 be withdrawn.

Rejection of Claims under 35 U.S.C. § 103

In the Office Action, Claim 3 was rejected under 35 U.S.C. § 103 as unpatentable over McCutchen (U.S. Patent No. 5,040,081).

Claim 3 depends on Claim 1 and is therefore patentable for at least the reasons given above with respect to Claim 1.

In view of the foregoing, it is requested that the rejection of Claim 3 under 35 U.S.C. § 103 be withdrawn.

Allowed Claim

In the Office Action, Claim 4 was allowed. However, Claim 4 has been amended to correct an antecedent basis problem. Allowance of Claim 4 is requested.

New Claims

Claims 5-18 have been added.

Support for Claim 5 can be found in Applicants' specification at page 6, lines 16-23. Support for Claims 6 and 7 can be found in Applicants' specification at page 6, lines 24-32. Support for Claim 8 can be found in Applicants' specification at page 7, lines 6-10 and page 8, lines 9-13. Support for Claim 9 can be found in Applicants' specification at page 6, line 33 to page 7, line 5. Support for Claim 10 can be found in Applicants' specification at page 8, lines 1-3. Support for Claims 11-16 can be found in Applicants' specification at page 1, lines 11-13; page 3, lines 1-10; page 4, lines 4-7; and page 6, line 6 to page 8, line 13. Support for Claim 17 can be found in Applicants' specification at page 4, lines 10-18. Support for Claim 18 can be found in Applicants' specification at page 4, lines 15-18.

Each of Claims 5-10 depends, either directly or indirectly, on Claim 4 and is therefore allowable as dependent on an allowable claim.

Claim 11 recites:

> A method for aligning a first set of data representing content occurring over a period of time with a second set of data representing content occurring over a period of time, each of the first and second sets of data including audio data, comprising the steps of:
>
> selecting a distinctive audio segment from the audio data of the first set of data, wherein the step of selecting comprises the steps of:
>
> evaluating each of a plurality of audio segments from the audio data of the first set of data; and
>
> identifying one of the plurality of audio segments, based on the evaluation of each of the plurality of audio segments, as the distinctive audio segment; and
>
> computing cross-correlation between the distinctive audio segment from the audio data of the first set of data and the audio data of the second set of data; and
>
> aligning the first and second sets of data based on the cross-correlation.

McCutchen does not appear to teach or suggest a method for aligning first and second sets of data in which a distinctive audio segment is selected from audio data of the first set of data and the first set of data aligned with the second set of data based on a cross-correlation between the distinctive audio segment and audio data of the second set of data. Thus, Claim 11 is allowable. Further, Claims 12-16, which each depend either directly or indirectly on Claim 11, are allowable as dependent on an allowable claim.

Claims 17 and 18 each depend on Claim 1 either directly or indirectly and are therefore each allowable for at least the reasons given above with respect to Claim 1.

CONCLUSION

Claims 1-4 were pending. Claim 4 was allowed. Claims 1-3 were rejected. Claims 1 and 4 have been amended. Claims 5-18 have been added. In view of the foregoing, it is requested that Claims 1-18 be allowed. If the Examiner wants to discuss any aspect of this application, the Examiner is invited to telephone Applicants' undersigned attorney at (408) 945-9912.

I hereby certify that this correspondence is being transmitted via facsimile to the U.S. Patent and Trademark Office, Group Art Unit 2644, facsimile number (703) 872-9306, on June 3, 2005.

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Date

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Signature

Respectfully submitted,

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